Improving diagnostic accuracy in aortic prosthetic graft infection
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Periaortic endograft infection due to *Listeria monocytogenes* treated with graft preservation

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A 67-year-old man presented to our hospital with general malaise, fever and diffuse abdominal and lower back pain 7 weeks after endovascular aneurysm repair. Blood samples showed a leukocyte count of $10.9 \times 10^9/l$ and a C-reactive protein of 239 mg/l. The computed tomography (CT)-scan showed fluid collections behind the proximal part of the endovascular graft and dorsal to the aorta. CT-guided translumbar needle aspiration of these collections yielded growth with *Listeria monocytogenes*. Prosthetic endograft infection is an extremely rare event, especially when it is caused by *Listeria monocytogenes*. Given the scarcity of this complication, no consensus has been reached for its treatment. In the described case, radiological drainage and prolonged antibiotic treatment resulted in favourable outcome at midterm follow-up with preservation of the endograft.
An infection of an endovascular stent-graft is very rare. Generally, clinical pathogenic organisms such as Staphylococcus aureus are identified as the predominant cause for graft infection followed by Escherichia coli, Enterococci, Streptococci, and other aerobic gram-negative bacilli. Among the rare causes of vascular graft infections Serratia, Yersinia enterocolitica, nontyphoid Salmonella and Listeria monocytogenes have been reported. The article reports a case of an infection of the aorta with Listeria monocytogenes after endovascular aneurysm repair and focuses on its treatment in which the endograft was preserved.

Case report

A 67-year-old man, with a history of chronic obstructive pulmonary disease (COPD), diabetes mellitus type II and myocardial infarction, was referred to our hospital in March 2006 because of an abdominal aortic aneurysm (AAA) of 78 mm (Figure 1, A). Serum leukocyte count and C-reactive protein (CRP) were not raised and computed tomography scanning (CT) showed no signs of an infection. The aneurysm appeared suitable for endovascular treatment, which was performed under antibiotic prophylaxis (cefazoline 1000 mg) by using a Cook Zenith stent-graft (Cook, Bloomington, Ind). Three days after this uncomplicated procedure, he was discharged from hospital. At the first routine follow-up visit after 6 weeks, CT-scanning showed no migration of the stent-graft, nor was there an apparent endoleak or infection (Figure 1, B). Twenty-eight weeks after endovascular repair, the patient developed fever, up to 39°C. He also complained of diffuse abdominal pain and pain in his lower back. He was admitted to another hospital for further evaluation. Blood samples showed a leukocyte count of 10.9 x 10⁹/l (standard value: 4.3 to 10.0 10⁹) and a CRP of 239 mg/l (standard value: <5 mg/l). A second CT-scan showed two fluid collections; the first located around the proximal part of the stent-graft and the second dorsal to the aorta (Figure 2). CT-guided translumbar needle aspiration of these collections yielded growth with Listeria monocytogenes. Antibiotic treatment with amoxicillin-clavulanic acid intravenously was commenced. The patient managed a livestock farm, where milk and cheese was being processed, and thereby was at risk for an infection with Listeria monocytogenes. Because of a suspected infection of the underlying stent-graft, the patient was transferred to our hospital.
In order to specify the contaminated site and the exact location of the collection, 18F-fluorodeoxyglucose-positron emission tomography (FDG-PET) scan was carried out 10 months after endovascular repair, showing focal tracer enhancement at the proximal sealing point of the stent-graft and distal part of the aneurysm and some uptake at the dorsally located fluid-collection (Figure 3). Cotrimoxazol 800/160 mg three times a day was added to avoid meningeal contamination. As a third CT-scan showed no reduction in size, and the fluid-collection was drained percutaneously. Thirty-five cc of brownish fluid was aspirated, and a drain was left behind. Cultures of the aspirated fluid remained sterile. Several days later, the patient left the hospital in good clinical condition. Amoxicillin-clavulanic acid was stopped and cotrimoxazol 800/160 mg continued for the next 6 months. The drain was removed at the out-patient clinic, 4 weeks after discharge. One year and seven months after his first operation, the patient was doing well. Blood analysis showed a normal leukocyte count of 7.6 x 10^9/l and a CRP of <5 mg/l. The latest CT-scan revealed virtually no fluid collection.

**Discussion**

A prosthetic graft infection after abdominal aneurysm repair is a serious complication. The incidence of graft infection has been reported to range from 0.6% up to 2.3%, with a mortality rate varying from 25% up to 88%. Generally, clinical pathogenic organisms such as *Staphylococci* and *Escherichia Coli* are identified as the predominant cause for graft infection. So far, six cases of infected prosthetic grafts with *Listeria monocytogenes* have been reported worldwide: one female and five male patients with a mean age of 60 years. These cases include two prosthetic femoropopliteal bypasses, two arteriovenous loop shunts, one case of aortic ascending replacement with prosthetic graft, and one report of an endoluminal bifurcated aortic prosthetic graft infection. The mean time of presentation was 2 years after the primary operation (range, 4 months to 10 years). Conservative therapy alone was successful in two of these cases (one femoropopliteal bypass and the aortic ascending graft).
Figure 1. Preoperative (A) and first postoperative CT-scan (B) showing no signs of infection.
Figure 2. CT-scan (transverse profile) of a fluid collection on the proximal dorsal part of the prosthetic endograft of the aorta (marked by arrow).

Figure 3. FDG-PET scan after fusion with CT-scan (sagittal profile) showing focal tracer enhancement at the proximal and distal sealing zones of the prosthetic endografts (marked by arrows).
The single patient with a *Listeria* infected endograft was a 77-year-old male, endovascularly treated for a painful 66 mm large AAA. Twelve weeks after implantation, the patient was re-admitted for sepsis with a temperature of 40°C. Bacterial cultures from fine needle aspiration of the aneurysmal sac and perigraft space yielded *Listeria monocytogenes*. Through laparotomy, en-bloc resection of the aneurysm and contained endograft was performed. At 10 months follow-up, the patient was doing well without signs of infection. \(^{10}\)

This case reports a second case of *Listeria monocytogenes* infection after endovascular aneurysm repair (EVAR). Both cases concern obese male patients who were admitted to the hospital with fever and abdominal and low back pain commencing a short period after EVAR treatment. In our case, comorbidity plus the required suprarenal clamping would have meant a seriously raised perioperative risk, which was the reason why we chose for radiological drainage instead of the invasive treatment as mentioned in the case described by Heikkinen et al. \(^{10}\) So far, conservative therapy alone was successful in only two of the six *Listeria* graft infections mentioned above. Other possible treatment options include surgical removal of the graft and infected area with subsequent replacement of an extra-anatomical graft, an in-situ reconstruction using a rifampicin-impregnated prosthesis, or an autologous vein reconstruction using the deep femoral vein.

Besides the six cases of prosthetic graft infection, 18 cases of primary arterial infection with *Listeria monocytogenes* have been reported worldwide. The 13 male and five female patients had an average age of 68 years (range 18 to 85 years). Infections included eight abdominal aortic aneurysms, four popliteal aneurysms, two thoracic aortic aneurysms, two femoral arteries, one iliac-, and one mesenteric superior artery. Surgery was performed in most of these primary infected aneurysms. \(^{11}\) Our patient worked with milk and cheese products as mentioned before. This makes it likely he had been in contact with *Listeria monocytogenes* before or after the operation. One can even speculate if the treated aneurysm was a mycotic aneurysm. However, at the time of implantation serum leukocyte count and CRP were not raised, and there were no signs of an infection on CT-scanning.

Infection of a prosthetic graft is associated with a high mortality and morbidity rate. \(^{1,2}\) Diagnostic imaging is first of all important for the detection of this complication to analyze the extent of the infection and to differentiate from other infectious diseases. CT-scanning seems to be the gold standard. \(^{12}\) However, hematomas and seromas in the vicinity of a vascular graft appear anatomically
similar to an abscess which makes it sometimes difficult to distinguish between noninfected and infected prosthetic grafts. Several studies have suggested the use of FDG-PET scan in addition to CT-scan to detect and evaluate the extent and site of origin of the graft infection in these complications. Another test used in the diagnosis of early prosthetic graft infection is 99mTc-HMPAO-labeled leukocyte scintigraphy, which seems to have a higher sensitivity than CT-scanning. However, few data are available on the usefulness of this technique in detecting early endovascular graft infection. Some studies reported that false positive results may occur in patients without endovascular graft infection, and it seems to be more useful in detecting graft infection after open repair.\textsuperscript{12,13,14}

**Conclusion**

An infection with *Listeria monocytogenes* is a rare but serious complication. Symptoms and signs should be recognized early to initiate immediate and appropriate antibiotic treatment possibly combined with radiological drainage. Although most previously described cases of prosthetic *Listeria* infections have been treated with removal of the complete graft, the endograft can be preserved with the described strategy and, therefore, seems an interesting option especially for those with a seriously raised perioperative risk.\textsuperscript{14}
References
